PEACE/WILLISTON
FISH & WILDLIFE
COMPENSATION
PROGRAM

BC hydro

BRITISH
COLUMBIA

A Reconnaissance Survey of Unnamed Lake (Gaffney Lake # 3)

M. J. Hunter
March 1997

PWFWCP Report No. 150

The Peace/Williston Fish & Wildlife Compensation Program is a cooperative venture of BC Hydro and the provincial fish and wildlife management agencies, supported by funding from BC Hydro. The Program was established to enhance and protect fish and wildlife resources affected by the construction of the W.A.C. Bennett and Peace Canyon dams on the Peace River, and the subsequent creation of the Williston and Dinosaur Reservoirs.

Peace/Williston Fish and Wildlife Compensation Program, 1011 Fourth Ave. 3rd Floor, Prince George B.C. V2L 3H9

Website: *www.bchydro.bc.ca/environment/initiatives/pwcp/*

This report has been approved by the Peace/Williston Fish and Wildlife Compensation Program Fish Technical Committee.

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105-02921/

A RECONNAISSANCE SURVEY OF

UNNAMED LAKE (GAFFNEY LAKE # 3)

WATERSHED:	**Williston Reservoir (Parsnip Reach)**
DATE OF SURVEY:	**July 26 - 27, 1996**
FIELD CREW LEADER:	**Mark Hunter**
FIELD ASSISTANT:	**Karin Mathias**
REPORT PREPARED BY:	**Mark Hunter**

BRITISH COLUMBIA CONSERVATION FOUNDATION

PEACE / WILLISTON FISH AND WILDLIFE COMPENSATION PROGRAM

B. C. MINISTRY OF ENVIRONMENT, LANDS AND PARKS

FUNDED BY: FOREST RENEWAL BRITISH COLUMBIA

RELEASED BY: _____

D. J. Cadden, Regional Fisheries Biologist

LAKE: Gaffney Lake # 3 **SYSTEM NAME:** Manson River

A.S.A.P. REFERENCE NO.: **WATERSHED CODE: 230-9167-413-202-175**

DATA ON FILE FOR THIS SURVEY

Location	X	Dissolved 02 / Temp. Profiles	X
Physical Data	X	Winter Dissolved 02 / Temp. Profiles	--
Bench Mark	X	Netting Record	X
Terrain Features	X	Lake Catch Summary	X
Access	X	Individual Fish Data	X
Resorts and Campsites	X	Fish Preserved	--
Other Developments	X	Stomach Analysis	X
Obstructions and Pollutions	X	Scale Reading	X
Special Restrictions	X	Location of Inventory Sites	X
Aquatic Plants	X	Photograph Directory	X
Wildlife Observations	X	Appendices	
Miscellaneous Comments	X	A: Water Chemistry Analysis	X
Lake Drainage	X	B: Tributary Stream Data	X
Fisheries Management Comments	X	C: Fish Scale Analysis	X
History of Previous Surveys	X	Bathymetric Map Reduction	X
Water Chemistry Summary	X	Bathymetric Map	--

LOCATION

Location:	approximately 76 km west-northwest of Mackenzie		
Elevation:	1075 ± 25 m	U.T.M.:	10.420874.6147389
Latitude / Longitude:	55°27'58" 124°15'06"	N.T.S. Map No.:	93-N/8
Management Unit:	7-28	Biogeoclimatic Zone:	Sub-Boreal Spruce
Ecoprovince:	Sub-Boreal Spruce	Ecoregion:	Fraser Basin
Ecosection:	Babine Uplands		

Drainage: Unnamed C. --> Unnamed L. --> Unnamed C. --> Unnamed C. --> Gaffney C. --> Manson R. --> Williston Reservoir (Manson Reach) --> Peace R.

PHYSICAL DATA

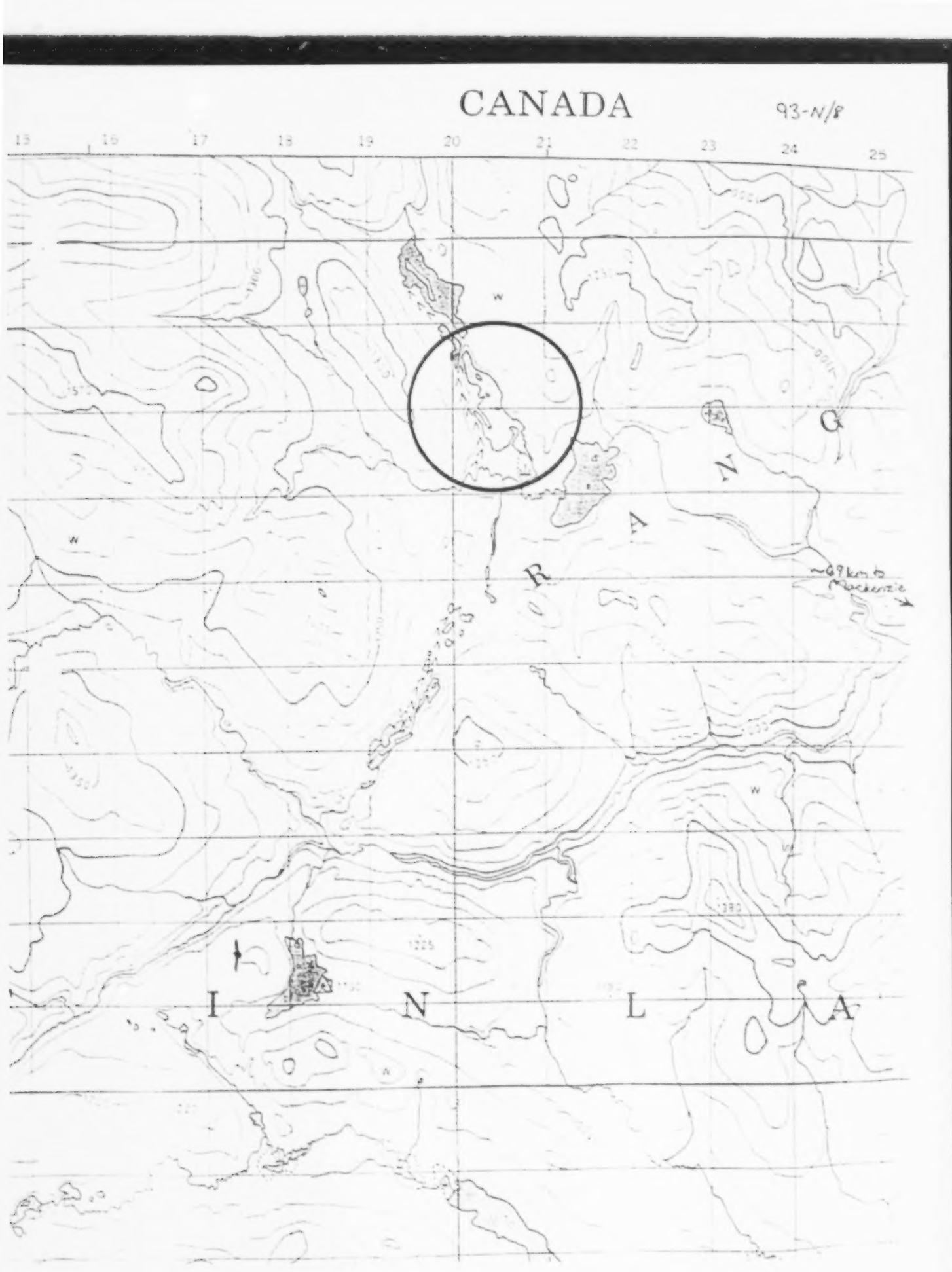
Lake Drainage Area:	1.6 km^2	Volume:	1 042 745 m^3
Water Surface Area:	289 995 m^2	Perimeter of Islands:	261 m
Area Above 6 m Contour:	207 07 m^2	Number of Islands:	2
Shoreline Perimeter:	4 691 m	Mean Depth:	3.7 m
Maximum Depth:	14.0 m	Secchi Reading:	5.8 m
Filterable Residue (TDS):	80 mg/L		

Sounding Device: Lowrance X-15 Elevation Source: Contour Interpolation

BENCHMARK

(Iron spike, center of red circle) located 2.0 m above present water level in a 32 cm diameter spruce tree that is 1.3 m from the present water's edge and located on the southwest side of the north bay approximately 200 m from the end of the north bay (Plate # 4).

High Water Mark: 0.40 m above water level at time of survey


CANADA
93-N/8
15
16
17
18
19
20
21
22
23
24
25
~69km to Mackenzie
I N L A

LAKE: Unnamed Lake (Gaffney Lake # 3)

TERRAIN FEATURES

Immediate Shoreline:

Gaffney Lake # 3 is surrounded on all sides, except in front of the marsh areas, by a growth of alders with lodgepole pine and spruce trees growing on steep to very steep slopes. Along the west side of the lake, fir trees are the dominant coniferous species growing behind the alder front. The south end of the lake is dominated by two sedge grass marshes that have willows growing on them just back from the lake's edge. A mixture of all three coniferous species grow on the moderate slopes of Gaffney Lake # 3's two islands.

Silts and organics dominate the shoreline substrate in front of the marshes and along the shoreline in the thin bay on the west side of the lake. In these areas, the lake's bottom drops off slowly towards the center of the lake. The rest of the lake has a substrate comprised of fines, gravels and cobbles covered in a thin layer of silts and organics, and the bottom drops off steeply towards the center of the lake. A cobble and gravel shoal surrounds the more southern island. There is a large amount of large woody debris along the shoreline of the lake as well.

Surrounding Country:

Gaffney Lake # 3 is surrounded by a mature forest of lodgepole pine and spruce trees with some fir trees. The terrain to the west is mainly steep hills. Rolling hills are found to the north and east of Gaffney Lake # 3. To the south, the land is relatively flat with some hills in the distance. An Unnamed Lake (Gaffney Lake # 4) lies to the south, and two Unnamed Lakes (Connaghan Lake and Gaffney Lake # 2) lie to the north. Gaffney Lake # 3 is situated within the Sub-Boreal Spruce biogeoclimatic zone.

LAKE: Unnamed Lake (Gaffney Lake # 3)

ACCESS

Directions:

From the junction of Highway 27, the Teardrop Forest Service Road and the Germansen Landing North Road, drive north for approximately 100 km, then continue on for approximately an additional 48 km on the Thutade Forest Service Road. At this point, there is an emergency landing strip that can be used for a helicopter landing site. Gaffney Lake # 1 is an approximate 6 km helicopter ride west of the emergency landing strip.

Road Type and Conditions:

Germansen Landing North road and the Thutade Forest Service Road are both well-maintained, two-lane gravel roads that are easily accessible with two-wheel drive vehicles. Logging trucks can be active on both of these roads.

Restrictions:

None known.

RESORTS AND CAMPSITES

There are no resorts or campsites on Gaffney Lake # 3.

OTHER DEVELOPMENTS

None noted.

OBSTRUCTIONS AND POLLUTIONS

None known.

LAKE: Unnamed Lake (Gaffney Lake # 3)

SPECIAL RESTRICTIONS

None known.

AQUATIC PLANTS

The following aquatic plants were identified during the time of the survey:

Equisetum sp.	sedge grasses
periphyton	

WILDLIFE OBSERVATIONS

The following wildlife or signs were seen during the time of the survey:

two common loons	golden-eye female with 3 ducklings
moose tracks and droppings	bald eagle

MISCELLANEOUS COMMENTS

1) A Forest Recreation Site, which could be used to service both Gaffney Lake # 1 and Gaffney Lake # 3, could be built to the north of Gaffney Lake # 3 on top of the steep hill.

2) Bathymetric map: The lake outline was drawn from an enlargement of air photo 30 BCB 94017: No. 188, flown June 22, 1994.

LAKE: Unnamed Lake (Gaffney Lake # 3)

LAKE DRAINAGE

General:

Gaffney Lake # 3 is fed by one inlet that enters the lake in the south end, and by approximately 19 seasonal inlets, 18 of which are found in the northwest corner of the lake. The outlet creek drains Gaffney Lake # 3 to the south, and flows for approximately 1.0 km into Unnamed Lake (Gaffney Lake # 4). An unnamed creek drains Unnamed Lake (Gaffney Lake # 4) to the east and runs for approximately 5.2 km to drain into another unnamed creek, which in turn flows for approximately 4.7 km to it's confluence with Gaffney Creek. Gaffney Creek flows north approximately 10.8 km before it joins the Manson River.

Major Systems:

There are no major systems.

Minor Systems:

Inlet # 1 - Unnamed Creek

Inlet # 1 enters Gaffney Lake # 3 from the south and helps to drain the marsh at that end (Plate # 5). The channel has an average wetted width of 0.6 m and depth of 0.3 m, with moss and sedge grass banks. Approximately 50 m upstream of the lake, Inlet # 1 goes underground. Along the middle section, the creek is heavily overgrown with willows. Inlet # 1 had no fisheries potential during the survey period.

Intermittent Inlets

In addition to an intermittent inlet in the southwest corner of the lake, there are approximately 18 intermittent inlets along the northwest side of Gaffney Lake # 3 that flow down a steep slope through gravel and moss substrate channels. None of these intermittent inlets had any fisheries potential during the survey period.

Outlet - Unnamed Creek

The outlet drains Gaffney Lake # 3 to the south from the end of the southeast bay (Plate # 6). The first 300 m of the outlet has an average wetted width of 17 m and depth of 0.6 m, and is passable with the motor boat. The substrate is comprised of silts and organics with some LWD, with banks of sedge grasses and mosses. Numerous rainbow trout were seen in the first 300 m while boating the creek. Approximately 340 m downstream of Gaffney Lake # 3, there is a 0.4 m high beaver dam (Plate # 7). A side channel, 0.5 m wide and 0.45 m deep, with good spawning gravels flows around the dam

to the left side of the creek (looking upstream). Below the dam, the creek narrows to an average wetted width of 3 m and becomes choked with sedge grasses. Approximately 425 m downstream of Gaffney Lake # 3, the outlet widens out again. A large unnamed creek enters the outlet from the left (looking upstream) approximately 450 m downstream of the lake. Downstream of this confluence point, the outlet widens; the substrate is fines with some pockets of gravels, and some large woody debris has fallen into and across the creek..

A Stream Survey card was completed for a sample site located approximately 550 m downstream of Gaffney Lake # 3 (Plates # 8 & # 9). The average wetted width is 10.6 m and the average maximum riffle depth is 0.24 m. The creek morphology is mainly runs (60%) with some pools (35%) and a tiny amount of riffles (5%). The substrate is comprised of fines (65%) and gravels (35%); the gravels occur in pockets along the length of the sample site. The water temperature was 9 °C at the time of the survey. For additional information, refer to Appendix B.

The unnamed creek that enters the outlet approximately 450 m downstream of Gaffney Lake # 3 has an average wetted width of 5.5 m and depth of 0.6 m with some pools being over 1 m deep. The substrate is mainly fines and gravels with some good spawning habitat. Ar island for 20 m. Where the two braids come back together, approximately 70 m upstream of the outlet, a small creek that drains a beaver pond located approximately 20 m away, enters the inlet from the left side (looking upstream).

A Stream Survey Card was completed for a sample site on the inlet creek to the outlet located approximately 150 m upstream from the confluence point (Plates # 10 & # 11). The average wetted width is 5.9 m and the average maximum riffle depth is 0.25 m. The creek morphology is comprised of runs (40%), pools (35%) and riffles (25%), with the average maximum pool depth being just over 1 m deep (1.025 m). The substrate is gravels (50%), fines (45%) and small cobbles (5%). The water temperature was 7 °C at the time of the survey. For additional information, refer to Appendix B.

LAKE: Unnamed Lake (Gaffney Lake ## 3)

FISHERIES MANAGEMENT COMMENTS

Gaffney Lake # 3 supports a very large population of rainbow trout with no other fish species present; however, most of the rainbow trout are infected with tapeworms and/or parasites in the body cavity and stomach. Although these tapeworms and parasites are removed when the fish are cleaned (they are attached to the internal organs), they do detract from the aesthetic quality of the fish. Therefore, this lake would make an ideal catch-and-release lake, especially for families as the rainbow trout are very easy to catch. For example, some of the rainbow trout would jump for a fly that we dangled above the water's surface from the boat. In the shallow parts of Gaffney Lake # 3, located in the southeast bay and in the thin southwest bay, rainbow trout were caught on almost every cast when using either a fly rod or spin-casting rod. Most of the available spawning habitat was found in the inlet creek to the outlet. Although infected, rainbow trout from Gaffney Lake # 3 could be used to stock the Unnamed Lake (Gaffney Lake # 1) that lies to the north.

HISTORY OF PREVIOUS SURVEYS

Lake Surveys:

None known.

Other Related Studies:

None known.

LAKE: Unnamed Lake (Gaffney Lake # 3)

WATER CHEMISTRY SUMMARY **Limnology Station No. 1**

Field Conditions:

Date:	July 27, 1996		
Time:	1300 hrs	Air Temperature:	22 °C
Wind Velocity:	3 - 7 km/h	Wind Direction:	from the SE
Cloud Cover:	3 / 10 o.c.	Surface Conditions:	light ripple
Secchi Disc:	5.8 m	Water Colour:	clear with greenish tinge

Method Used:

Dissolved Oxygen:	YSI Model 57 Oxygen / Temperature Meter
Water Temperature:	YSI Model 57 Oxygen / Temperature Meter
Air Temperature:	Hand-Held Alcohol Thermometer
pH (field):	Digital pH Pocket Tester
H2S (field):	Hach H2S Field Test Kit
Laboratory Used:	Pacific Environmental Science Center
Water Sampler:	Vertical Alpha Water Bottle (Vandorn)
Metal Sampler:	By Hand; Preserved With 2.0 mL Nitric Acid
Substrate Sampler:	Substrate Sample Not Taken

Water Sample Chemistry: **SEAM Site No.:** E 223157

	Sampling Depths	
	Surface (0.5 m)	Lower (13 m)
Alkalinity (lab)	61.5 mg / L	78.9 mg / L
Filterable Residue 105°C (lab)	80 mg / L	90 mg / L
H2S (field)	N/A	0.7 mg / L
Nitrogen - Total (lab)	0.15 mg / L	0.75 mg / L
Non-Filterable Residue (lab)	< 5 mg / L	10 mg / L
pH (field)	5.9	6.2
pH (lab)	8.02	7.16
Phosphorus - Total Dissolved (lab)	0.005 mg / L	0.01 mg / L
Specific Conductance (lab)	124 µS / cm	157 µS / cm

Bottom Depth: 14.0 m

Substrate Sample Depth: N/A

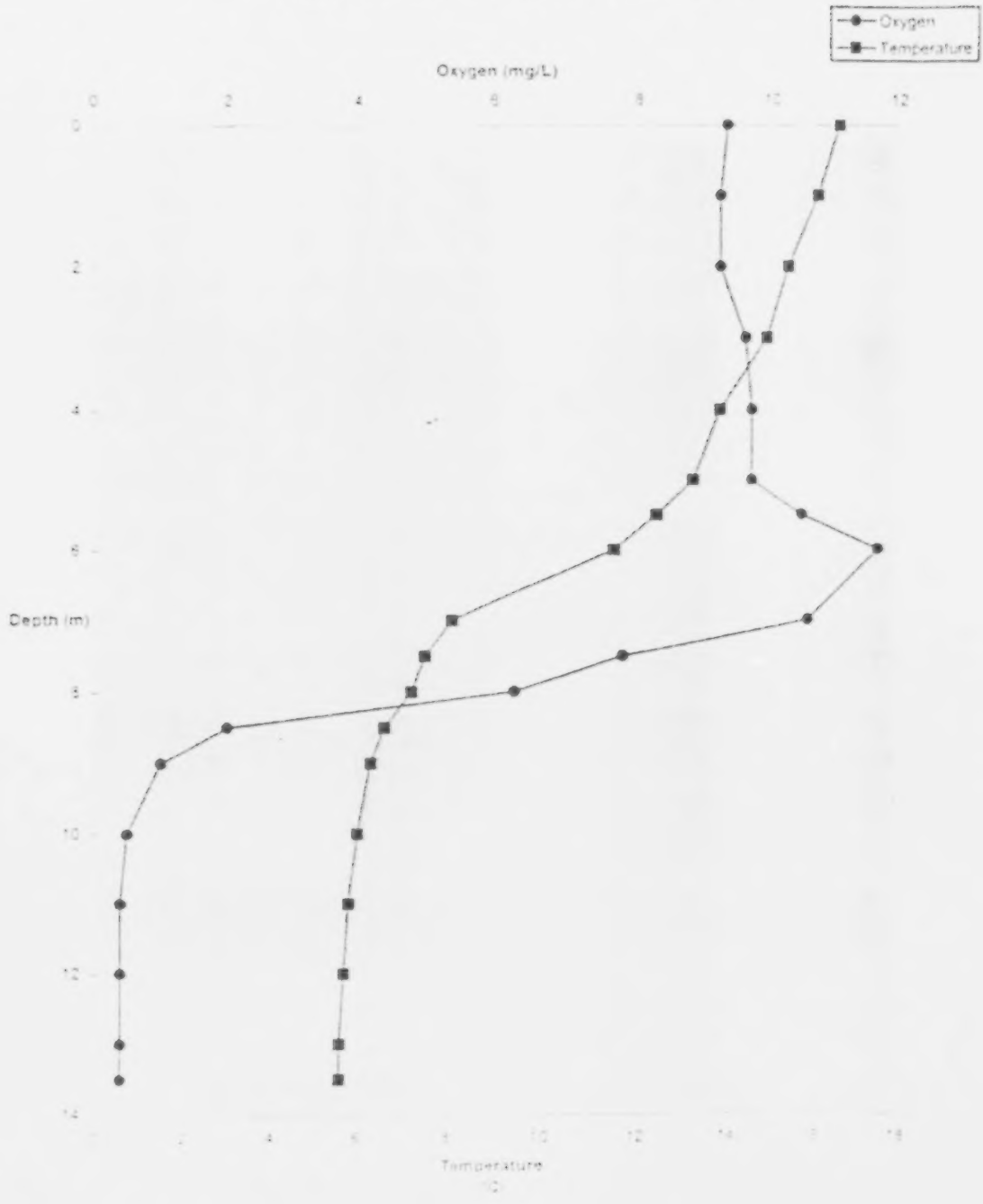
* additional analyzed parameters and results, including metals, are found in Appendix 1

LAKE: Unnamed Lake (Gaffney Lake # 3)

SUMMER OXYGEN / TEMPERATURE DATA

DEPTH (m)	02 (mg/L)	TEMPERATURE (°C)
Surface	9.3	16.6
1.0	9.2	16.1
2.0	9.2	15.4
3.0	9.6	14.9
4.0	9.7	13.8
5.0	9.7	13.2
5.5	10.5	12.4
6.0	11.7	11.5
7.0	10.6	8.1
7.5	7.8	7.5
8.0	6.3	7.2
8.5	2.0	6.6
9.0	1.0	6.3
10.0	0.5	6.0
11.0	0.4	5.8
12.0	0.4	5.7
13.0	0.4	5.6
13.5	0.4	5.6
14.0	Bottom	

SUMMER OXYGEN / TEMPETATURE PROFILE



LAKE: Unnamed Lake (Gaffney Lake # 3)

NETTING RECORD

Mesh Size Experimental Order: 25, 76, 51, 89, 38, 8,64 mm

NETTING SITE # 1

Type:	Sinking Monofilament Gill Net			
Date Set:	July 27, 1996		Time:	1220 hrs
Date Lifted:	July 27, 1996		Time:	1524 hrs
Net Dimensions:	Length:	91.4 m	Depth:	2.4 m
Shallow End Mesh Size:	25 mm		Depth:	1.0 m
			Substrate:	organics over large cobble
Deep End Mesh Size:	64 mm		Depth:	9.0 m
			Substrate:	silt / organics

Comments: Net started approximately 2.5 m out from the present lake's edge. While pulling in the net, 18 rainbow trout were released alive.

LAKE CATCH SUMMARY

Species	Netting Site No. 1	Angled	Other	Total	Number Sampled	Number Preserved	Size Range (cm)
	54	20	0	74	30	0	13.2 - 35.0

Minnow Traps:

Bait: Sardines

Trap No.	Hours	Depth (m)	Substrate	Species	No. Caught	Size Range (cm)
1	4:22	0.7	organics over fines	empty	0	-
2	4:21	**0.5**	silt / organics over fines	**RB**	1	13.2
3	4:20	1.0	silt / organics over fines	**RB**	4	8.9-14.5
4	4:17	0.9	organics and LWD over cobbles	empty	0	-

LAKE: Unnamed Lake (Gaffney Lake # 3)

INDIVIDUAL FISH DATA

Date Captured: July 27, 1996

Method: Sinking Monofilament Gillnet

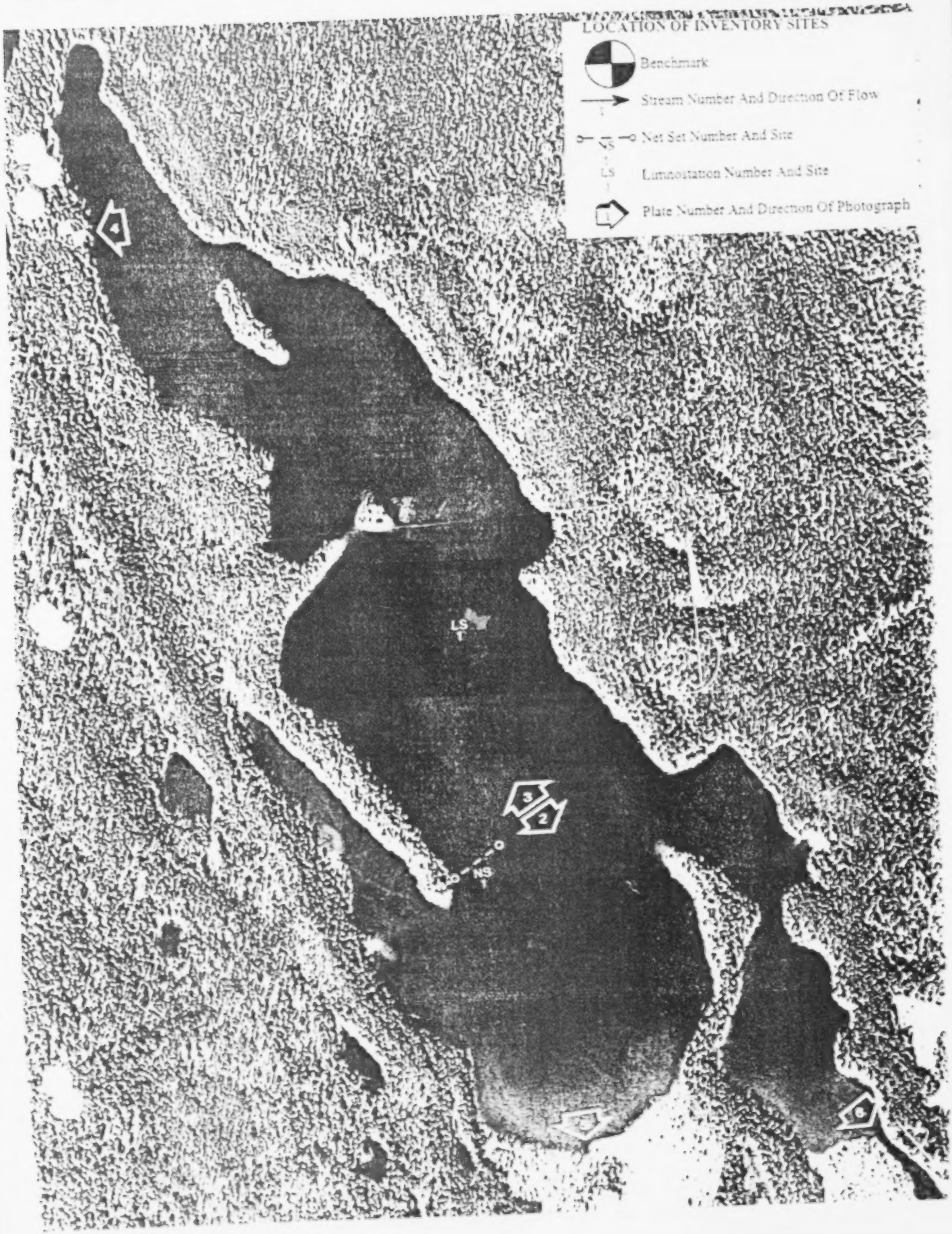
M - Male
F - Female
? - Not Obvious

IMM - Immature
MG - Maturing
MT - Mature
GV - Gravid
SP - Spent
? - Not Obvious

EG - Egg
FR - Fin Ray
HD - Head
ML - Milt
OT - Otolith
SC - Scale

Species	Fork Length (cm)	Weight (grams)	Sex	Gonadal Maturity	Sample Type	Age (yr)	Stomach Contents: Plankton	Insects	Fish	Other	Comments
RB	30.0	270	M	MG	SC			CF			P in BW
RB	25.0	165	M	IMM	SC		Da	CF			
RB	31.0	247	M	MG	SC						St empty
RB	25.7	154	M	MG	SC		Cr				P in BW
RB	26.7	184	F	MG	SC						P on outside of St; St empty
RB	24.2	151	M	MG	SC		Cr, Da				TW in BW
RB	26.4	196	M	IMM	SC		Cr				TW in BW
RB	26.4	179	M	MG	SC		Da				P in BW
RB	24.8	165	M	MG	SC		Cr				P and TW in BW
RB	27.4	197	M	IMM	SC		Da	UN*			P and TW in BW
RB	35.0	288	M	IMM	SC			UN*			P and TW in BW
RB	28.4	225	M	MG	SC		Cr				TW in BW
RB	27.1	175	M	IMM	SC		Cr				P in BW
RB	22.2	97	F	MG	SC		Cr				P and TW in BW
RB	25.1	160	F	MG	SC		Da				P in BW
RB	24.5	156	F	MG	SC		Da				TW in BW
RB	23.0	126	M	IMM	SC						TW in BW
RB	13.2	21.5	M	IMM	SC		Cr, Da				
RB	26.2	143	M	IMM	SC			CF			P in BW, St empty
RB	25.3	162	M	MG	SC		Cr				TW in BW
RB	26.2	160	M	IMM	SC		Da				P in BW
RB	27.2	190	F	MG	SC						TW in BW, St empty
RB	21.5	90.5	F	MG	SC		Da				P and TW in BW
RB	21.5	98	F	MG	SC		Da				TW in BW
RB	24.4	112	F	MG	SC			G			TW in BW
RB	26.5	179	F	MG	SC		Cr				TW in BW
RB	27.5	230	F	MG	SC						St empty
RB	24.1	162	F	MG	SC		Da				P in BW
RB	22.3	110	F	MG	SC						TW in BW, St empty
RB	23.6	148	F	MG	SC		Da	CF			TW in BW

B - Beetle
BW - Body Wall
C - Clams
CF - Caddisfly
Ch - Chaoborus
Cr - Chironomids
Da - *Daphnia*
Di - Diptera
G - *Gammarus*
L - Leech
Li - Lice
O - Organics
P - Parasites
S - Snails
St - Stomach
TP - Tape Worm
UN - Unidentified
WB - Water Boatman
WF - Whole Fish


LOCATION OF INVENTORY SITES
Benchmark
Stream Number And Direction Of Flow
Net Set Number And Site
Limnostation Number And Site
Plate Number And Direction Of Photograph
LS 1
NS 1
4
3
2
5

LAKE: Unnamed Lake (Gaffney Lake # 3)

PHOTOGRAPH DIRECTORY

Plate	Roll : Number	Description
1	10:18	Aerial view of Unnamed Lake (Gaffney Lake # 3) looking north. Note Unnamed Lake (Gaffney Lake # 1) in the background.
2	12: 18 - 21	Panoramic view of Unnamed Lake (Gaffney Lake # 3) looking southwest from the center of the lake.
3	12: 15 - 17	Panoramic view of Unnamed Lake (Gaffney Lake # 3) looking northeast from the center of the lake.
4	12: 11	View of the benchmark located 2.0 m above present water level in a 32 cm diameter spruce tree that is 1.3 m from the present water's edge and located on the southwest side of the north bay approximately 200 m from the end of the north bay.
5	12: 14	View of the mouth of Inlet # 1 where it enters Unnamed Lake (Gaffney Lake # 3) in the southwest corner of the lake.
6	12: 22	View of the mouth of the Outlet Creek where it drains Unnamed Lake (GaffNey Lake # 3) to the south from the end of the southeast bay.
7	11: 3	Upstream view of beaver dam # 1 on the Outlet Creek, located approximately 340 m downstream of Unnamed Lake (Gaffney Lake # 3). Dam height is 0.4 m.
8	12: 24	Upstream view of the sample site on the Outlet Creek, taken approximately 570 m downstream of Unnamed Lake (Gaffney Lake # 3).
9	12: 23	Downstream view of the sample site on the Outlet Creek, taken approximately 530 m downstream of Unnamed Lake (Gaffney Lake # 3).
10	11: 1	Upstream view of the sample site on the Inlet Creek to the Outlet Creek, taken approximately 135 m upstream of the confluence point.
11	11: 2	Downstream view of the sample site on the Inlet Creek to the Outlet Creek, taken approximately 165 m upstream of the confluence point.

LAKE: Unnamed Lake (Gaffney Lake # 3)

12	12: 12	Picture of one of the rainbow trout that was caught in the net set. Note the orange at the tip of the dorsal fin.

LAKE: Unnamed Lake (Gaffney Lake # 3)

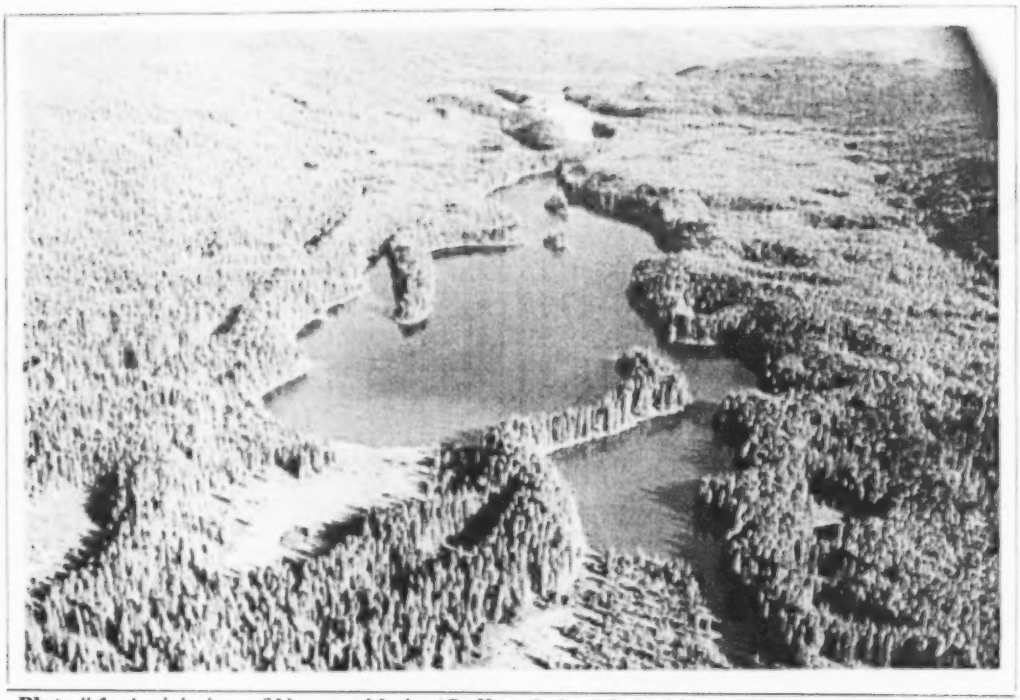


Plate # 1: Aerial view of Unnamed Lake (Gaffney Lake # 3) looking north. Note Unnamed Lake (Gaffney Lake # 1) in the background.

LAKE: Unnamed Lake (Gaffney Lake # 3)

Plate # 2: Panoramic view of Unnamed Lake (Gaffney Lake # 3) looking southwest from the center of the lake.

LAKE: Unnamed Lake (Gaffney Lake # 3)

Plate # 3: Panoramic view of Unnamed Lake (Gaffney Lake # 3) looking northeast from the center of the lake.

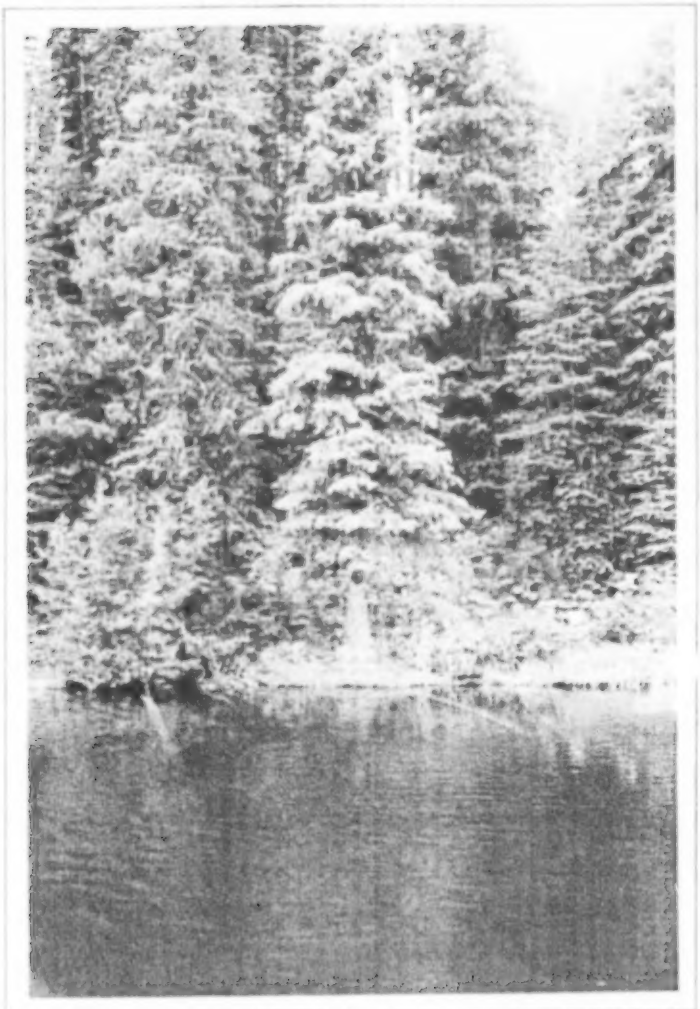


Plate # 4: View of the benchmark located 2.0 m above present water level in a 32 cm diameter spruce tree that is 1.3 m from the present water's edge and located on the southwest side of the north bay approximately 200 m from the end of the north bay.

Plate # 5: View of the mouth of Inlet # 1 where it enters Unnamed Lake (Gaffney Lake # 3) in the southwest corner of the lake.

Plate # 6: View of the mouth of the Outlet Creek where it drains Unnamed Lake (Gaffney Lake # 3) to the south from the end of the southeast bay.

LAKE: Unnamed Lake (Gaffney Lake # 3)

Plate # 7: Upstream view of beaver dam # 1 on the Outlet Creek, located approximately 340 m downstream of Unnamed Lake (Gaffney Lake # 3). Dam height is 0.4 m.

Plate # 8: Upstream view of the sample site on the Outlet Creek, taken approximately 570 m downstream of Unnamed Lake (Gaffney Lake # 3).

LAKE: Unnamed Lake (Gaffney Lake # 3)

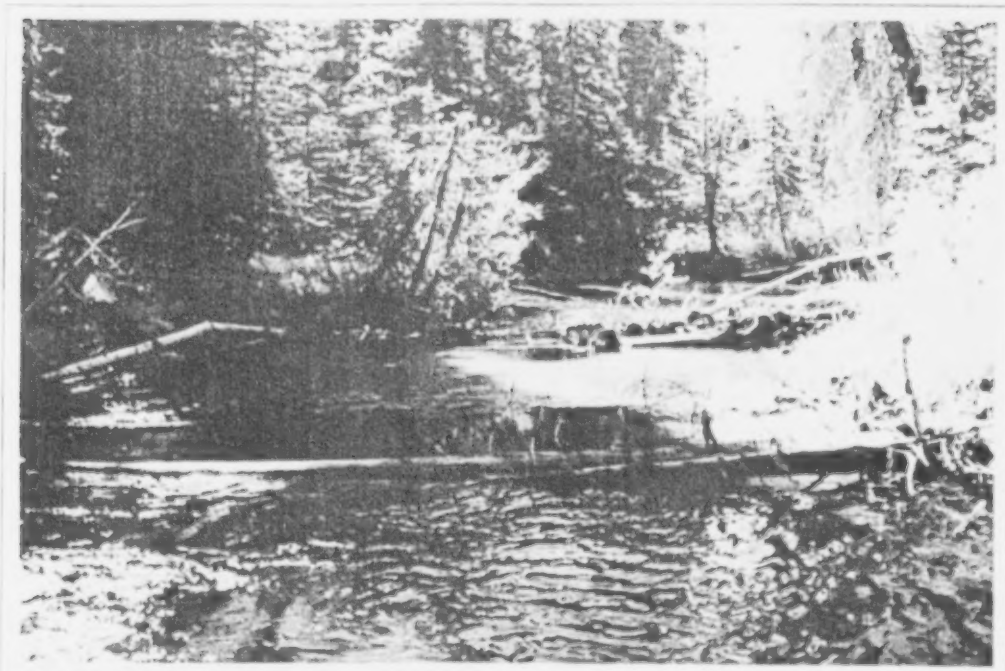


Plate # 9: Downstream view of the sample site on the Outlet Creek, taken approx imately 530 m downstream of Unnamed Lake (Gaffney Lake # 3).

Plate # 10: Upstream view of the sample site on the Inlet Creek to the Outlet Creek, taken approximately 135 in upstream of the confluence point.

LAKE: Unnamed Lake (Gaffney Lake # 3)

Plate # 11: Downstream view of the sample site on the Inlet Creek to the Outlet Creek, taken approximately 165 m upstream of the confluence point.

Plate # 12: Picture of one of the rainbow trout that was caught in the net set. Note the orange at the tip of the dorsal fin.

Appendix A

LABORATORY REPORT

Water Chemistry Analysis

RESULTS FOR UNNAMED LAKE-GAFFNEY LK #3 SAMPLES

Parameter Analyzed		Units	963415-001	963415-002
ALKALINITY		mg/l	61.5	78.9
DUCTIVITY		uS/cm	124	157
...TALS/TOTAL (WATER-ICP)	AG	mg/l	<.01	-
	AL	mg/l	<.06	-
	AS	mg/l	<.06	-
	B	mg/l	<.01	-
	BA	mg/l	.026	-
	BE	mg/l	<.001	-
	CA	mg/l	18.7	-
	CD	mg/l	<.006	-
	CO	mg/l	<.006	-
	CR	mg/l	<.006	-
	CU	mg/l	<.006	-
	FE	mg/l	.007	-
	K	mg/l	1	-
	MG	mg/l	2.5	-
	MN	mg/l	.004	-
	MO	mg/l	<.01	-
	NA	mg/l	1.2	-
	NI	mg/l	<.02	-
	P	mg/l	<.1	-
	PB	mg/l	<.06	-
	SB	mg/l	<.06	-
	SE	mg/l	<.06	-
	SI	mg/l	3.77	-
	SN	mg/l	<.06	-
	SR	mg/l	.069	-
	TI	mg/l	<.002	-
	V	mg/l	<.01	-
	ZN	mg/l	<.002	-
NITROGEN/AMMONIA		mg/l	.008	.006
/NITRITE		mg/l	<.002	<.002
/NITRITE+NITRATE		mg/l	<.002	<.002
/TOTAL		mg/l	.15	.75
PH		Rel.U.	8.02	7.16
PHOSPHORUS/O-PO4		mg/l	<.001	<.001
/TOTAL		mg/l	.021	.099
/TOTAL DISSOLVED		mg/l	.005	.01
RESIDUE/FILTERABLE		mg/l	80	90
/NON-FILTERABLE		mg/l	<5	10
BC CLIENT STUDY CODE			20	20
SAMPLING AGENCY			91	91
SITE IDENTIFIER/NUMBER			E223157	E223157
COLLECTION START DATE		y/m/d	96/07/29	96/07/29
UPPER DEPTH		METERS	0.5	13
TEMPERATURE ON ARRIVAL		deg.C	10	10

Appendix B

Tributary Stream Data

D.F.O. / M.O.E. Stream Survey Form

DFO / MOE
STREAM SURVEY FORM

Stream Name: Unnamed Ck (local) Outlet to Unnamed Lk (Creek #3)
Watershed Code:
Location: ~300 m D/S of Unnamed Lk
(Coal Creek 46 ° 7)
Date Y M D: 96 07 22 Time: 10:30 Access: Km: 2.4 Mouth:
UTM: 43-418
Photos:
Air Photos:
Access: Method:
Riffle: 3 Length:
Glide: 1 Channel: 40
Pool: 1 Y N
Side Channel:

C	PARAMETER	VALUE	METH
	Ave. Chan. Width (m)	8.5	ST
	Ave. Wet Width (m)	5.2	ST
	Ave. Max Riffle Depth (cm)	25	DM
	Ave. Max Pool Depth (cm)	120	DM
	Gradient: % 2	1.5	TC
	% Pool: 70 Riffle: 30		GE
	Side Chan. %		GE
	% Cover: Area %		GE
	Size Index %	50	GE
	COVER Total %	90	GE
	Cover Type: Organic / Boulder / Rootwad / Cobble / Undercut	50 / 40 / 0 / 5 / 0	
	Stream Discharge: 2 cms Accuracy		SE

SPECIFIC DATA: 10.0 6.4 9.6 / 7.5 6.0 7.8 / 120 60 30 70 100 115

BED MATERIAL

		%
1	Rubble (64-256mm)	65
	Gravel (2-64mm)	25
	Sand (0.06-2mm)	10
	Silt (0.004-0.06mm)	0
	Clay (<0.004mm)	0
	Bedrock (1)	0

Dominant: 3 Composition: L / M / H

BANKS

2	Angle: 45 Stability: 30
	Texture: (1) 2 3 4
	Cover: EN CO FC OG (UC) N/A
	Water Depth Rate: 0-2 2-5 5-10 10+ N/A
	Bank: Dir L M H Floods
	Flood Height (m): 0.5 Beaches: Y (N)
	Bank %: 5 Undercut:
	Width (m): Depth: Undercut:

OBSTRUCTIONS

C	Type	Loc

DISCHARGE

Parameter	Value	Method	Sample Data
Wetted Width (m)	6.5	—	8.0 4.8
Mean Depth (m)	0.3	DM	0.28 0.25 0.35 0.28 0.28 0.28
Mean Velocity (m/s)	3.2	FLM	3.2 3.2 3.2 3.2 3.2 3.2
Discharge (m³/s)	4.68	DM	

REACH SYMBOL
Plan:
Width Index Channel Index: Bed Material:

FISH SUMMARY

C	Species	No.	Size Range (mm)	Life Phase	Use	Method/Ref.

STREAM VALLEY CROSS-SECTION
Looking Downstream
L R
PLANIMETRIC VIEW

COMMENTS

Channel Stability: Debris: Management Concerns: Restrictions: Riparian Zone: Values: Fish Habitat: Etc:

1 most of the discrete is dirt, a little is rotted rock or gravel
2 water not more above / a little is fine dirt, some rock

DFO / MOE

STREAM SURVEY FORM

Stream Name: Unnamed Ck (local) Inlet Ck to Outlet Ck of Unnamed Lk — Method

Watershed Code: — Location: ~ 100 m U/S of confluence to outlet of Unnamed Lk (Control Lk #3) — Map: 92-N/8 — UTM — Photos: — All Photos — Date: Y M D: 96 08 20 — Time: — Agency: — Crew: PH WB — Address — Latitude: 1 — Longitude: 1 — 30 — N — W

C	PARAMETER	VALUE	METH	SPECIFIC DATA
	Ave. Chan. Width (m)	12.5	ST	10.5 4.0 14.2 13.5
	Ave. Wet Width (m)	6.0	ST	6.5 4.0 8.2 4.5
	Ave. Max Riffle Depth (cm)	25	CM	31 34
	Ave. Max Pool Depth (cm)	100	CM	110 110 60 110
	Gradient %	2	TC	
	% Pool: S / Rif: P / Other: O	2 P 98 O	GE	
	Sec. Chan. %	0 0-10 0 10-40 0 >40	GE	
	ASI: Type / Area %	0 0-3 0 3-5 0 >5	GE	
	Debris: Type / Stable %		GE	
	COVER Total %	40	GE	
	Comp. (to this) / Boulder / Large Woody Debris / Undercut	100% 50 20 0 10 20 10		
	Instream Vegetation %	5	Assess ESE	

BED MATERIAL %

Fines	(< 2 mm)	45
Gravels	(2 - 16 mm)	25
Cobble	(16 - 64 mm)	20
Small Boulders	(64 - 128 mm)	10
Large Boulders	(128 - 256 mm)	0
Bedrock (Al)	(> 256 mm)	0

Dominant Substrate: — Consolidated: — M H

BANKS

L	Height (m)	0.1	Angle	2			
	Texture	F	G	L	R		

Comments: EN CO FC DE (SC) N/A

Valley Channel Ratio: 1:1 2-5 5-10 (10+) N/A

Flood Stage: Dry L M (H) Flood

Flood Signs (Min): — Braided: Y (N)

Bars (%): 10 — Depth: — Deposit: —

Water Temp °C: 15 — Air °C: — Time (2400):

OBSTRUCTIONS

C	Type	Location

DISCHARGE

Parameter	Value	Method	Sample Data
Wetted Width (m)	4.0	ST	3.3 5.0
Mean Depth (m)	0.4	DM	0.3 0.4 0.4 0.5
Mean Velocity (m/s)	1.8	FDM	
Discharge (m³/s)	2.6	FDM	

REACH SYMBOL (Title)

Upstream Channel Slope — Bed Material

FISH SUMMARY

C	Species	No.	Size Range (mm)	Life Phase	Use	Method/Ref.

STREAM VALLEY CROSS-SECTION — Looking Downstream — L — R

PLANIMETRIC VIEW

COMMENTS

Channel Stability: — Debris: — Management Concerns: — Observations: — Riparian Zone: — Valley Wall Processes: — Fish:

1 — [illegible] small pools created in main channel. Streambanks appear to be fairly susceptible to erosion.

Entered by:

Date Entered:

Appendix C

FISH SCALE ANALYSIS

Age Determination Completed By:

A.M.C. Technical Services Ltd.
Melinda M. Hirst
6809 Phillip Road.
Lantzville, B.C.
VOR 2H0

Appendix D

BATHYMETRIC MAP

Reduced to
34%
of Original Size

STATISTICS AT TIME OF SURVEY

Elevation	1672	m. A.S.L.
Surface Area	260995	sq.m.
Area above last contour	25307	sq.m.
Volume	1427183	cu.m.
Mean Depth	5.5	m.
Maximum Depth	14.0	m.
Perimeter Mean Wave	1670	m.
Perimeter Shoals	283	m.
Shoals Depth	1.0	m.

Unnamed Gaffney Lake #3